



RIPE NCC

RIPE NETWORK COORDINATION CENTRE

Something's Wrong on the Internet

How Internet Measurements Help
Us Detect Internet Events

Qasim Lone | 7 May 2024 | RIPE 88 Student Event



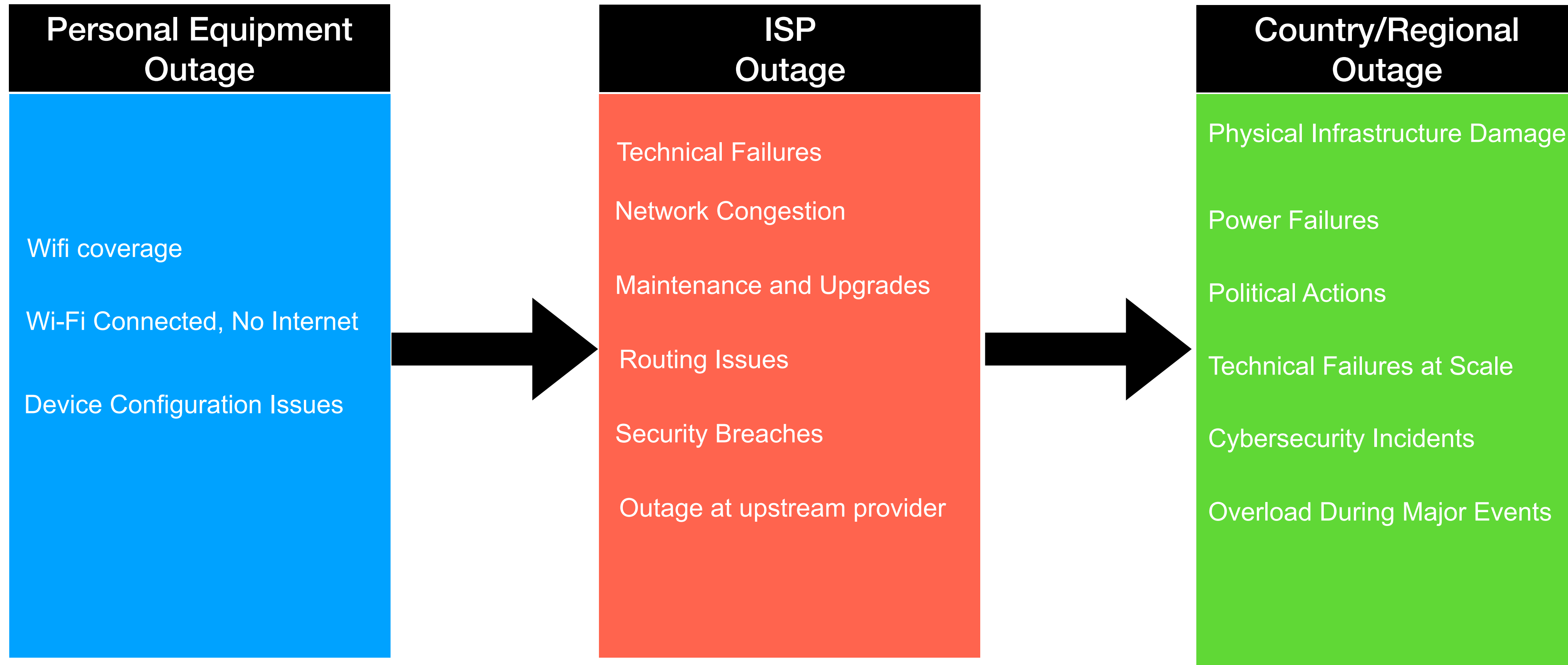
No Internet

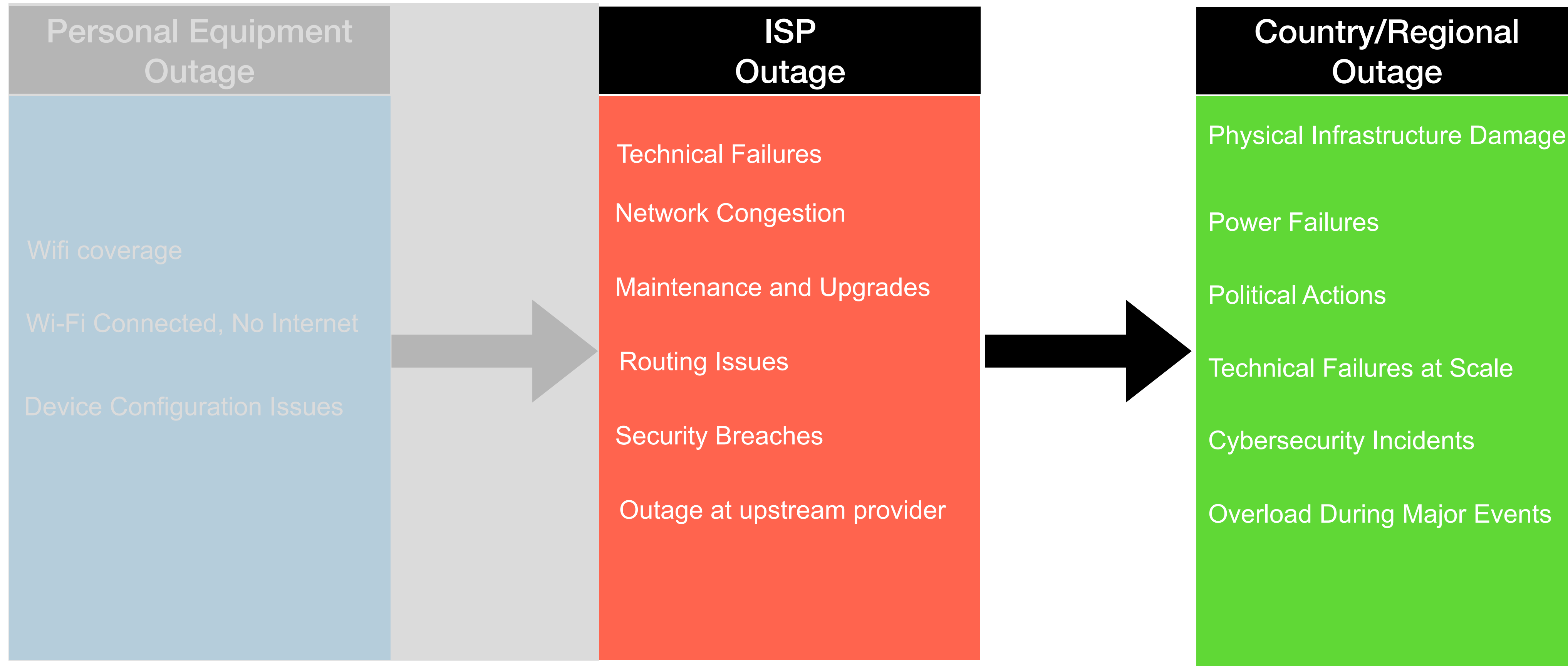
Try:

- Checking the network cables, modem and router
- Reconnecting to Wi-Fi

ERR_INTERNET_DISCONNECTED







Publicly Available Datasets



- Control Plane

- Determine how data is routed across the Internet using protocols like BGP, ensuring efficient and reliable paths through constant updates to routing tables.
- Route Collectors:
 - RIS
 - Routeviews

- Data Plane

- Active and passive traffic flows
- Traceroute, Ping, DNS etc

- Examples:

- RIPE Atlas
- Open Intel
- Caida Datasets
 - Some are publicly available other's can be requested by academics



Routing Information Service

Routing Information Service (RIS)



- RIS is a routing data collection platform, started in 1999
 - all historical data is publicly available
- Deployed at Internet Exchange Points
- Collects raw BGP data from peers
 - stores BGP messages and routing table dumps
- Real-time routing information, as opposed to information in databases and routing registries
- Is a source of data for many other services

Why collect BGP data?



- BGP doesn't have in-built security mechanisms and routing incidents are not rare
- Routing problems and Looking glasses are temporary
- BGP history is recorded to track what is happening and what has happened
- Better visibility → greater security → lower risk of a BGP attacks

Who is RIS for?



- Network operators, network policy makers
 - To check specific routes and routing incidents
 - To troubleshoot Internet routing
 - To develop future plans based on routing trends
- Researchers
 - To investigate notable events occurring in the Internet (i.e. network disruptions in specific countries, service outages, etc.)

How can you use RIS?



- Available as:
 - Raw data (archived MRT files)
 - Live stream – RIS Live
 - Whois query interface – RISwhois
 - Visualisations in RIPEstat
- Find more at ris.ripe.net



The screenshot shows the RIS Live interface in a web browser. The address bar displays 'ris-live.ripe.net'. The interface is divided into several sections:

- Demo:** A section explaining that subscriptions are sent as JSON objects. It includes a configuration form with fields for 'prefix', 'path', 'type', 'require', 'moreSpecific', 'lessSpecific', 'host' (set to 'rrc11.ripe.net'), 'peer', and 'socketOptions' (with 'includeRaw' and 'acknowledge' checkboxes).
- Code examples:** A section providing examples of using the RIS Live WebSocket interface. It includes a 'Javascript' tab with a code snippet for subscribing to a stream and outputting messages to the console, and a 'Python' tab.
- Live RIS BGP messages:** A section showing real-time BGP messages. It includes a status bar with a pause button, a 'Connected' indicator, and a message count of '3814 matching messages ~379 kbit/s'. Below this, two JSON messages are displayed, each preceded by a timestamp and delay: '// Received at 16:38:56 (3.92 second delay)'. The messages contain fields like 'timestamp', 'peer', 'peer_asn', 'id', 'host', 'type', 'path', 'community', 'origin', 'announcements', 'next_hop', 'prefixes', and 'withdrawals'.



RIPE Atlas

RIPE Atlas



- RIPE Atlas is the RIPE NCC's Internet measurement platform
- It is a global network of devices that actively measure Internet connectivity
- Anyone can access this data via Internet traffic maps, streaming data visualisations, and an API
- RIPE Atlas users can also perform customised measurements to gain information about their own networks

How we collect data?



- 12,000+ RIPE Atlas probes connected in 169 countries
- 787 RIPE Atlas Anchors
- 14,000+ results collected per second
- 33,000+ measurements currently running



What Can I Do With RIPE Atlas?



- RIPE Atlas customised measurements allow hosts and sponsors to conduct measurements on their own network(s) using other probes within the RIPE Atlas network:
 - Continuously monitor network reachability from thousands of vantage points around the globe
 - Investigate and troubleshoot network issues with quick, flexible connectivity checks
 - Create alarms using RIPE Atlas status checks, which work with your own monitoring tools
 - Check the responsiveness of DNS infrastructure, such as root name servers
 - Test IPv6 connectivity
- A complete collection of use cases, published research and analyses based on RIPE Atlas is published on [RIPE Labs](#)





Case Studies

Internet Access Disruption In Turkey - July 2016¹



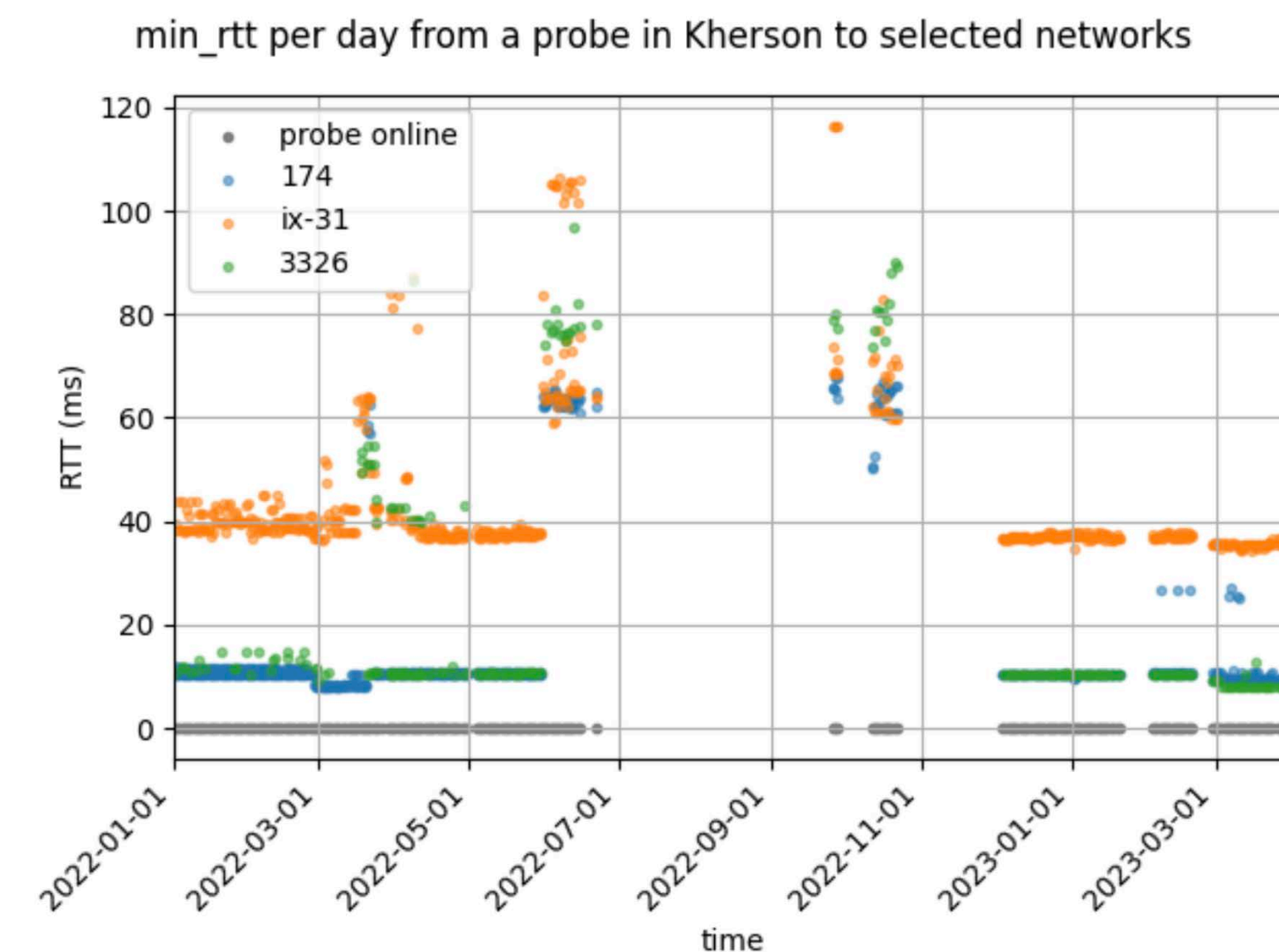
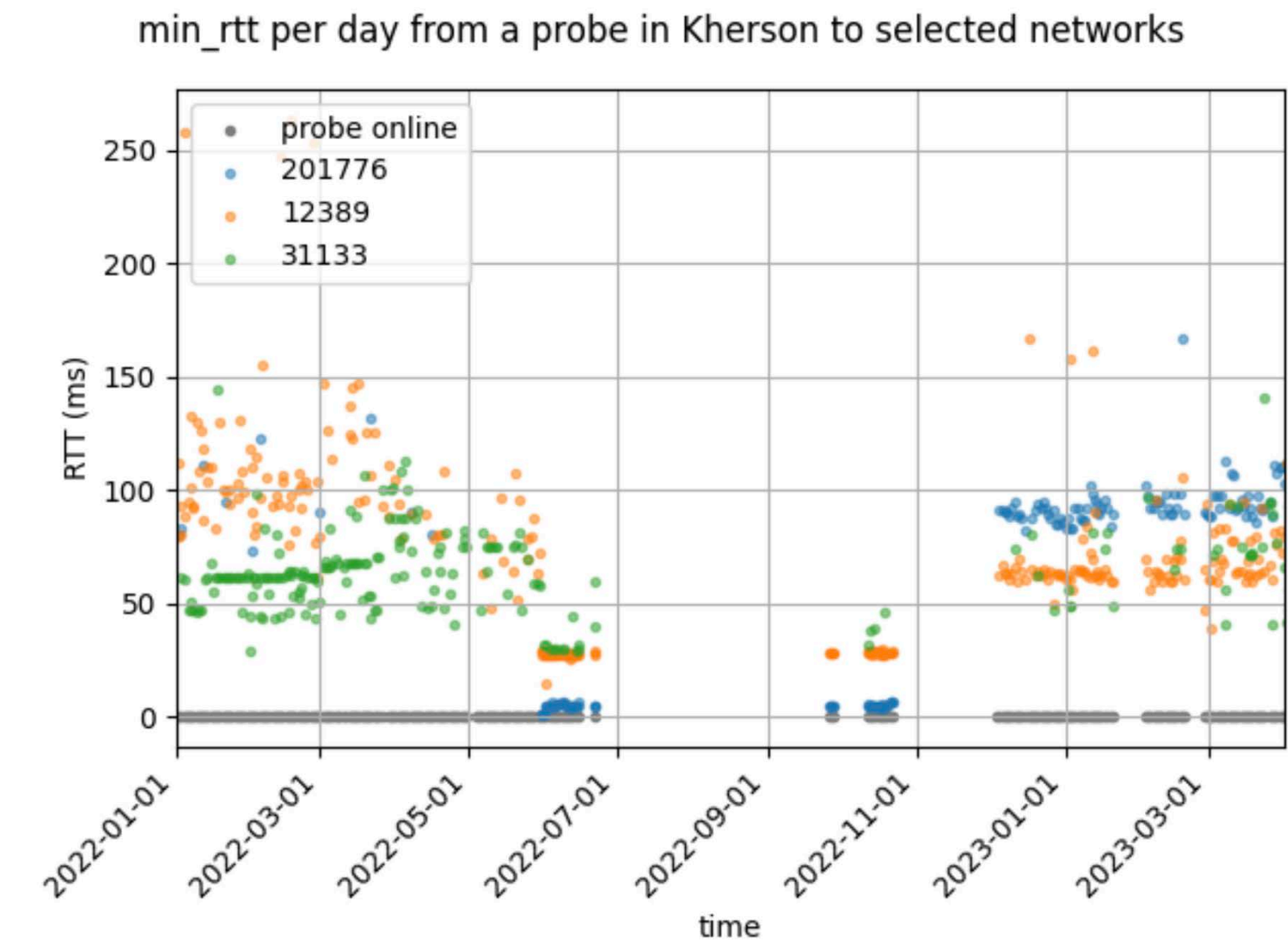
- User-initiated measurements for Twitter and Facebook showed anomalies.
- Twitter SSL fetches failed across multiple networks in Turkey starting at 21:30 UTC, suggesting possible network interference.
- SSL fetches timing out after five seconds could indicate either blocking or severe throttling; the exact cause remains undetermined.



The Resilience of the Internet in Ukraine - One Year On²



- A probe in Kherson provided crucial network data during the city's occupation and liberation.
- Latency to Russian networks decreased significantly after Kherson's occupation in March 2022, indicating rapid integration of internet infrastructure.
- Conversely, latency to other Ukrainian networks and to the West increased during the occupation.
- After liberation in November 2022, network latencies quickly returned to pre-occupation levels.
- Similar latency trends were observed in Kyiv, suggesting a consistent regional network response.



DNS Censorship (DNS Lies) As Seen By RIPE Atlas³



- DNS is essential for connecting to services, making it a prime target for censorship.
- Censorship often targets DNS resolvers, altering responses for control or commercial reasons.
- RIPE Atlas probes are valuable for analyzing DNS behavior globally, particularly useful in detecting censorship.
- Probes can be directed at specific resolvers or use the default resolver indicated by local network settings.

```
% python resolve-name.py --country=CN --requested=30 www.facebook.com
Measurement #3048986 for www.facebook.com/A uses 8 probes

[1.2.3.4] : 1 occurrences
[59.24.3.173] : 1 occurrences
[159.106.121.75] : 5 occurrences

Test done at 2015-11-28T13:44:17Z
```

```
% python resolve-name.py --country=FR --requested=100 romecasino.com
Measurement #3049070 for romecasino.com/A uses 100 probes

[217.19.248.132] : 64 occurrences
[ERROR: SERVFAIL] : 6 occurrences
[ERROR: NXDOMAIN] : 11 occurrences
[127.0.0.1] : 15 occurrences

Test done at 2015-11-28T14:14:27Z
```

```
% python resolve-name.py --country FR t411.io
Measurement #3049724 for t411.io/A uses 500 probes

[ERROR: SERVFAIL] : 41 occurrences
[104.24.124.37 104.24.125.37] : 187 occurrences
[ERROR: NXDOMAIN] : 43 occurrences
[127.0.0.1] : 197 occurrences
[146.112.61.106] : 2 occurrences

Test done at 2015-11-29T16:04:34Z
```

Conclusions



- Understand how network behaviors impact internet stability.
- Learn to use tools like RIPE Atlas and RIS for real-time troubleshooting.
- Apply theoretical knowledge to practical network scenarios.
- Explore careers in network engineering and cybersecurity.

References



- [1] <https://labs.ripe.net/author/emileaben/internet-access-disruption-in-turkey-july-2016/>
- [2] <https://labs.ripe.net/author/emileaben/the-resilience-of-the-internet-in-ukraine-one-year-on/>
- [3] https://labs.ripe.net/author/stephane_bortzmeyer/dns-censorship-dns-lies-as-seen-by-ripe-atlas/



Questions



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